Modeling Job Satisfaction in Southern Ohio

Cristie Margerum & Nicklaus Roach
Department of Statistics
Miami University

Motivation and Objective

For college students, a common fear is that it will not only be difficult to find a job after graduation, but that the job will not meet our expectations. We look to those with experience in the job field to inform us on what factors might impact an individual's satisfaction with their job. By collecting data over multiple industries and examining aspects of various jobs, such as salary and education, we hope to determine which factors have the most impact on job satisfaction.

Research Question

What are the significant factors that determine job satisfaction?

Data

Data was gathered via online survey over the area of southern Ohio. The figure below gives a visual representation of the physical locations where the survey was distributed. Darker colors indicate areas where more survey responses were collected. Most of the data collected was in the Oxford/Cincinnati region (see Fig 2).

Fig 1: Number of Respondents by Age
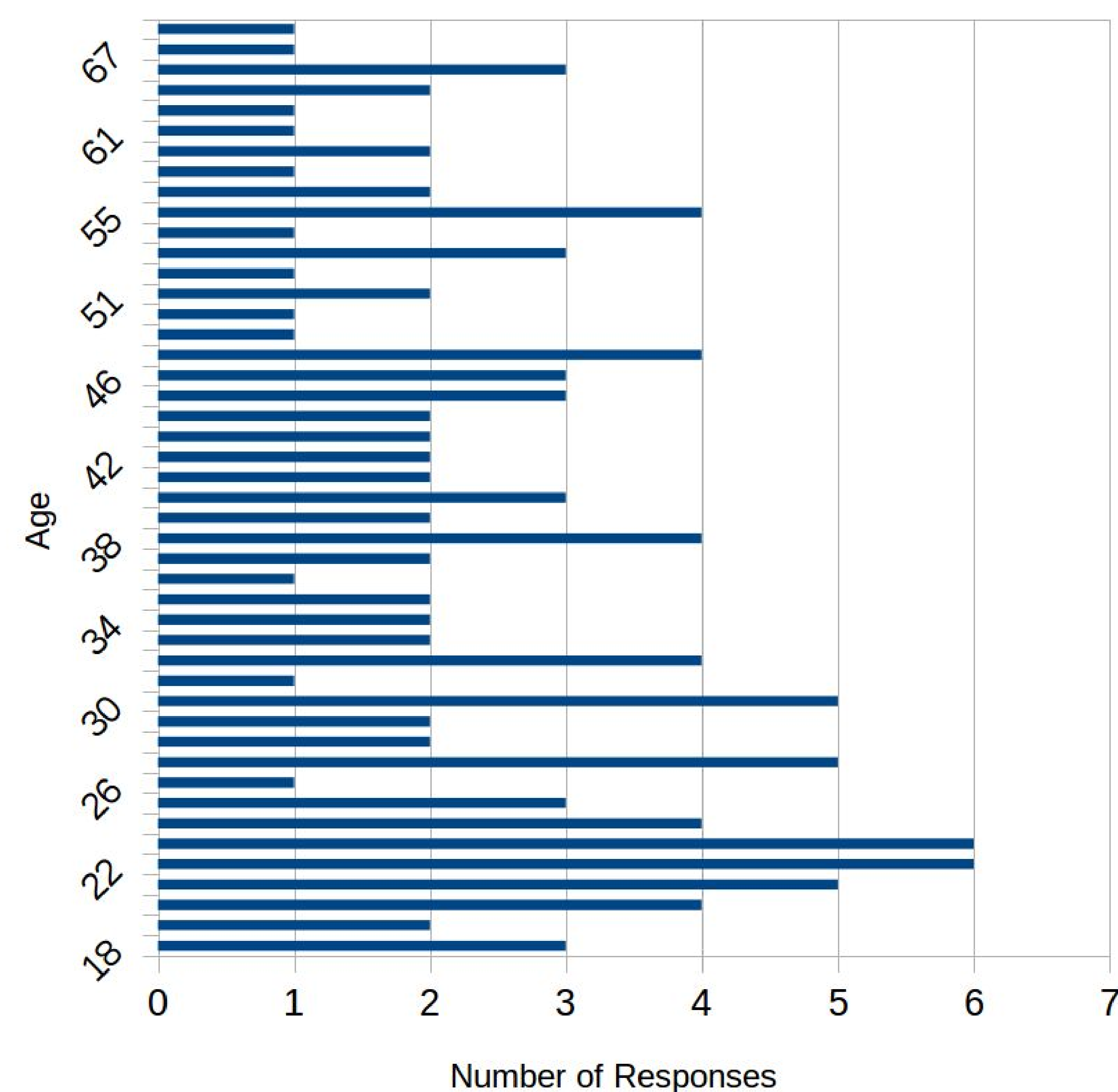
The highest number of responses for the survey came from people in their early twenties (see Fig 1) while the average age of respondents was 37. Aside from the higher response rate among this age group, the rest of the responses by age were fairly uniform with an average of 2.5 responses for each age.

Table 1 : Model Factors and Positions

| Factor	Levels
Gender	Male, Female
Age	Any positive whole number.
Family Size	Any positive whole number.
Level of Education	High School Diploma/GED, Vocational/Trade School, Some College, Associate's/Technical Degree, Bachelor's Degree, Master's Degree, Doctorate Degree
Area of Study	Engineering, Education, Health/Medicine, Business/Finance, Creative Arts, Physical Sciences, Mathematics/Statistics, Social Sciences
Full or Part Time	Full-Time, Part-Time
Salary	Intervals of $15,000
Hours	Any positive whole number.
Description	Academic, Health, Service, Utilities, Manufacturing, Information Technology, Finance/Insurance, Art and Design, Agriculture, Government/Military
Years	Any positive whole number.
Vacation Use	Some, All, None, I am not provided vacation time
Health Benefits	Yes, No

Methodology

The data can be modeled with an ordinary least squares equation. We took our full model to the model that included all factors that were surveyed. The response y, job satisfaction, is a binomial response variable, defined by the piecewise function.

$$y = \begin{cases} 0 & \text{if not satisfied} \\ 1 & \text{if satisfied} \end{cases}$$

The way in which a respondent was considered "satisfied" by his or her job was if they rated their satisfaction as greater than or equal to five. Conversely, a person who rated their satisfaction as less than five was considered not satisfied.

Fig 2: Density of Responses Relative to Location
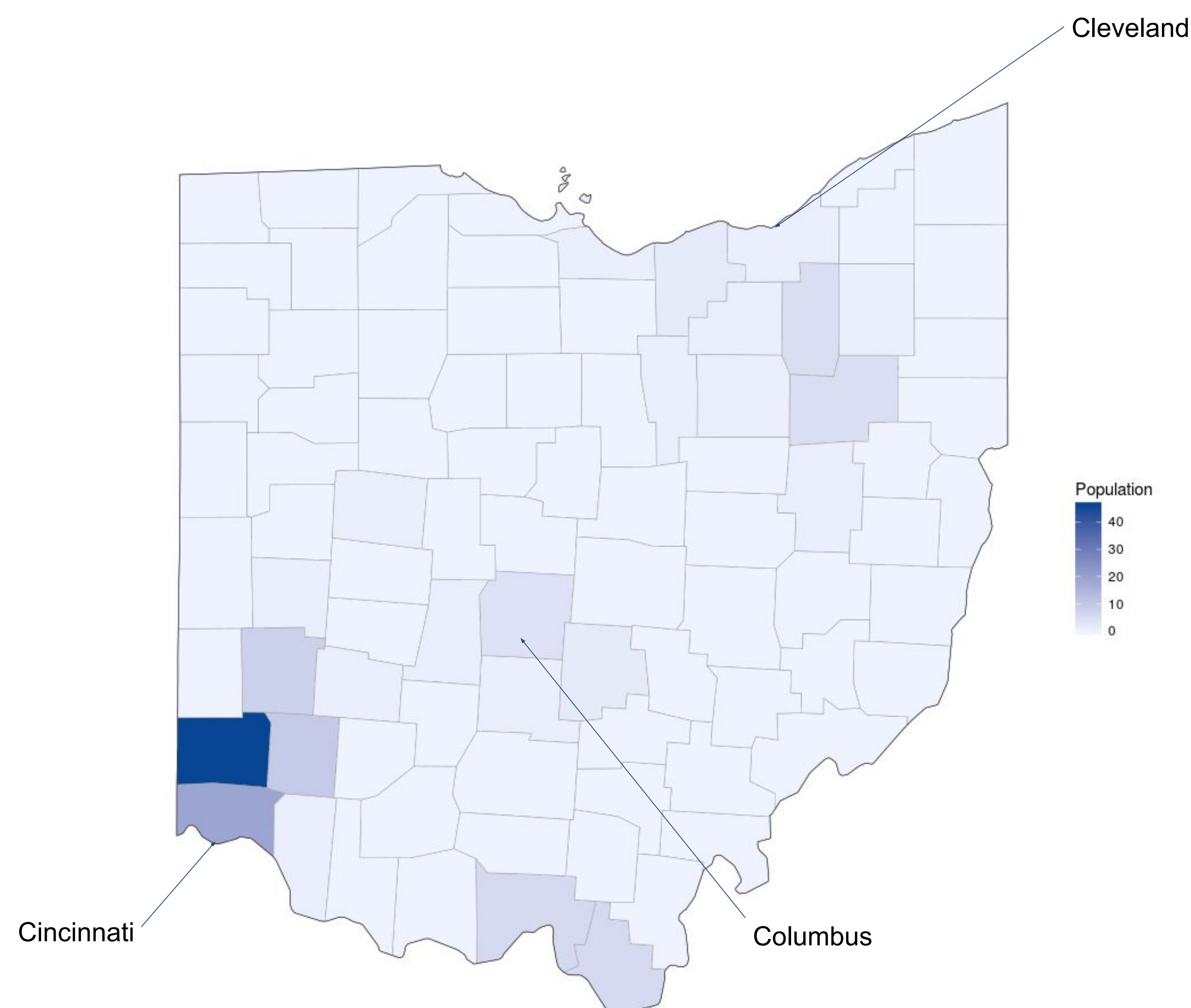
Proposed Model

The model that was chosen included the following factors: full/part time, vacation use, age, and education level. This model was chosen for both the statistical significance of its factors and its goodness-of-fit.

$$\ln\left(\frac{\pi}{1-\pi}\right) = 14.6 - 5.55\,(PartTime) + 10.95\,(Not\ Provided\ Vacation\ Time)$$
$$+ 28.3\,(No\ Vacation\ Time\ Used) + 21.08\,(Some\ Vacation\ Time\ Used) + 0.1939\,(Age)$$
$$- 16.18\,(Bachelor's\ Degree) - 7.558\,(Doctorate\ Degree) - 18.99\,(High\ School\ Diploma/GED)$$
$$- 1.037\,(Master's\ Degree) - 21.57\,(Some\ College) - 26.72\,(Vocational/Trade\ School)$$

Log Likelihood Ratio

The null hypothesis assumes that all parameters in the proposed model are equal to zero, whereas the alternate hypothesis assumes that at least one parameter is not equal to zero. In other words, the log likelihood ratio will produce a p-value that, if small, will indicate that the proposed model is more useful than the full model.

$$G^2 = -2ln\left(\frac{L(Reduced\ Model)}{L(Full\ Model)}\right)$$

Fig 3: Residual Plots
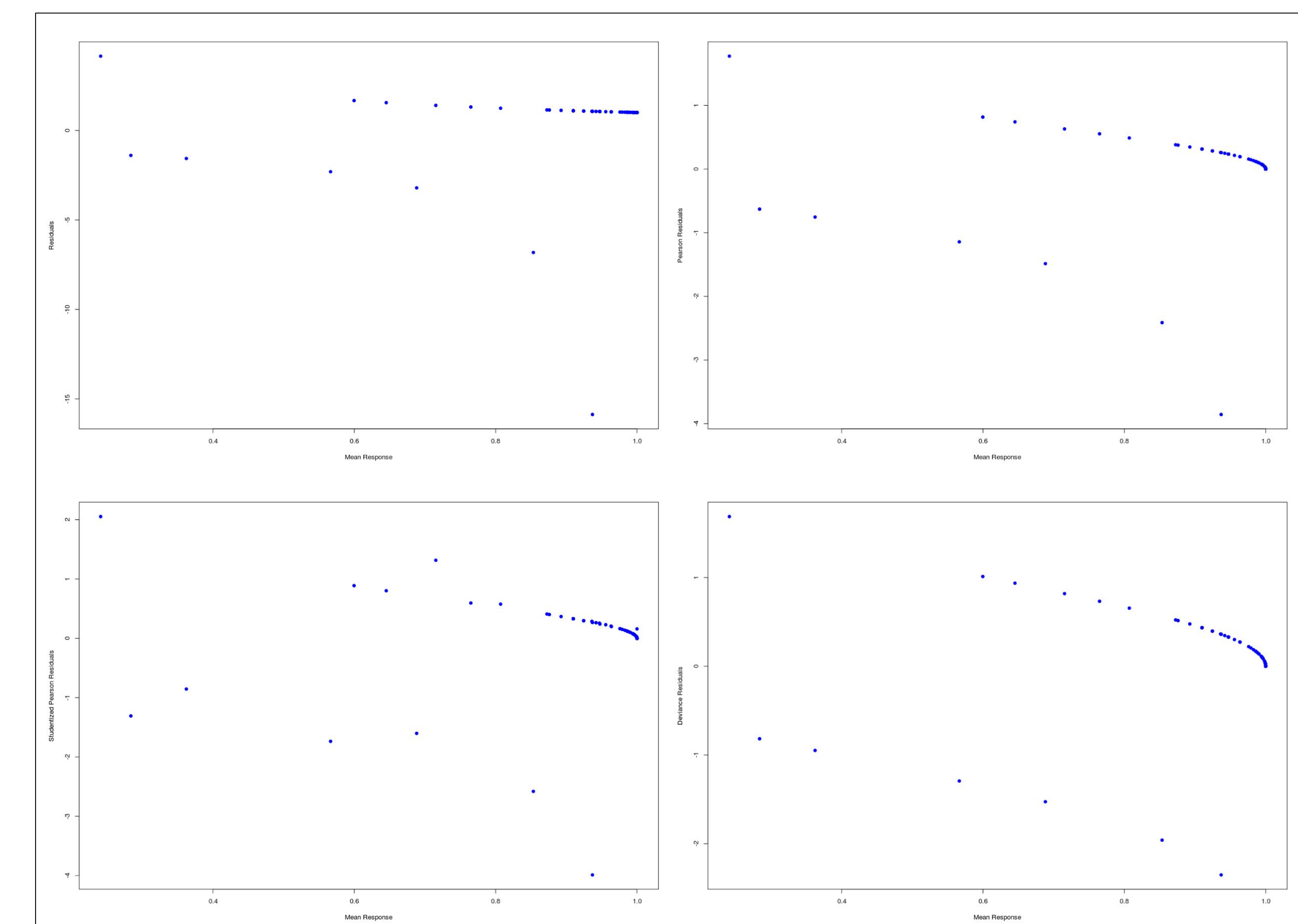
Conclusion

Based on our model, we can conclude that the factors which significantly affect job satisfaction are age, level of education, vacation use, and whether the individual is a part or full time employee. Although none of the factor levels of the respondents' education level were significant, they did play a part in the significance of the other factors (however, no explicit interaction term was found to be significant). For example, a 22 year old is more likely to be satisfied with their job if they complete their Bachelor's Degree and obtain a full time position than if they do not complete college and/or obtain a part time position.